



The Role of Collaboration and Integration in the Supply Chain of Construction Industry

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Abstract

It has found that the construction sector of Pakistan is growing fast due to the China-Pakistan Economic Corridor but history shows that construction projects never achieves its targets. The literature revealed the major hurdles behind the construction is supply chain issues. Supply chain of construction is deficient due to lack of collaboration and integration. The aim of this study is the empirically verify the role of supply chain collaboration (information sharing, Joint decision making, and risk and reward sharing) and supply chain integration (supplier integration, internal integration, and customer integration) with performance. This is a quantitative study, a total of 350 questionnaires were distributed to registered construction firms with Pakistan Engineering Council and 221 were received and considered for analysis after purification, validity and reliability. Multiple-regression technique was applied through SPSS. This study has unique findings as all integration approaches have significant effects while collaboration is not working for the same industry. This proves that members of supply chain construction can get benefit from integration but they hesitate to share their risks, rewards, and planning to all stakeholders. This study will help managers in decision making. This study will also help the government of Pakistan and China in completing their construction projects in time and with the designated cost.

Keywords: Construction Industry; Supply Chain Collaboration; Supply Chain Performance; Supply Chain Integration.

1. Introduction

The progress of any country lies in the success of its Development plans. As per proverb in French” when the construction industry grow everything flourish”. A lot of money can be saved by completing the project in planned time and duration which indicates the efficiency and effectiveness of project management, though this case happen rarely. Delay in construction can be defined as taking the additional time than the actual planned schedule. These delays always prove to be probable factor of risk and many studies are looking out ways to manage these risks. Cost risks are the main risks associated with delay in projects. Project delays usually result in the increase in the plan cost. The probability of delay is most common problem and it affects significantly through huge ways. Completing the project timely is pointer of proficient construction industry. The competence of the project organization and assessment of project performance is measured by construction time taking it as bench mark. In order to avoid the delay and minimize them, it is necessary to identify and analyze the tangible causes of delay. The most regular is trouble of construction project is delay [1]. The delay in construction project is not only limited to Pakistan however it is a worldwide reality and all the countries faced this global fact. Project management and supply chain collaboration play vital role in the management of any project by using different tools, procedure and techniques and techniques.

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SCC can deliver substantial benefits and advantages to its partners to attain the long-term advantages separately and collectively, information sharing is described as creating a stronger connection between the organization and its providers. The sharing of information promotes stakeholders to engage in quality improvement programs in addition to regular company activities. Joint decision-making aims at creating a long-term client connection, reducing client complaints and improving customer satisfaction. By enhancing the client connection, an organization can react rapidly to altering client requirements. Supply chain performance management procedures integrated into joint decision-making have been shown to have a direct impact on performance. Risk and Reward Sharing (RRS) is defined as a specific level of relationship between chain members that results in higher business performance than individual firms would have achieved [2].

Supply chain collaboration has a strong existence in any organization which is inevitable in nature. Successful Construction managers use SCI to a good effect to cement their chances for a project success while on the other hand those managers who see SCI with repugnance and shied away from its effective use, find it difficult to further increase their chance of project triumph with minimal authority they have in their respective organizations [3]. Lack of planning would be the major problem towards delivery of material at site in time. There are 3 major resources used in construction project: Steel, Cement and Mix. Steel and cement are always delivered on advance and delivery duration of regular steel is maximum 100 tons/day and for cement bulker, it is 2 days for project in Karachi only. Supply chain organization would facilitate you in other manner if individual giving some favor for steel and cement tax revision from Government also made problems to construction project in last five years cement is raised by 30% and steel is raised by 65%.

Table 1. Delay Factors relevant to Construction

S.no	Causes of delay in construction industry	Agreed%	Not Agreed %
1	Material description used construction is not agreed upon	60	40
2	Lack of acquiring new tool and technique	70	30
3	Unfair coordination between members	60	40

After the grading and scoring, the most important factor relevant to construction firms is lack of acquiring new equipment, on which 70% respondents agreed. Delay in construction material used on which 70% responded agreed, and unfair relationship with subcontractor with employees is causes of delay on which 60% responded agree [4]. It is noticed that after the scoring and grading the most important factor that the client's notice is the ability and arrangement that is economic. Delay in construction project is the most important problem. It exists to some extent in every project and varies from project to project. Some overrun the allocated time for day, other may overrun for years. So it is important to point out the real causes of these delays in order to avoid and minimize them [3]. The delay in project designated time causes failure of the project or in other word, it impedes the success of delay in construction project is the most important problem. It exists to some extent in every in project and varies from project to project. Some over run the allocated time for days, others may overrun for years. So it is important to point out the real causes of these delays in order to avoid and minimize them. The delay in project designated time causes failure of the project or in other words, it impedes the success of the project. It is essential for the general management to keep track of the progress of a project with the baseline plans, to minimize the possibilities of the occurrence of delays at the earliest and ensure the success of the project [5].

Supply Chain Performance is independent variable of our study. SCP refers to the extended supply chain's activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the SC to deliver that performance in a responsive manner. In SCM, supply chain collaboration is defined as two or more autonomous firms working jointly to plan and execute supply chain operations. It can deliver substantial benefits and advantages to its partners to attain the long-term advantages separately and collectively, information sharing is described as creating a stronger connection between the organization and its providers. The sharing of information promotes stakeholders to engage in quality improvement programs in addition to regular company activities. SCC will be independent variable of our study [6]. SCP refers to the extended supply chain's activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner.

This becomes doubly important for the construction managers to acknowledge the underlying effect of the SCC impact & significance whereas denying its existence would not make their task any potent. Another important aspect is to analyze all organizations have SCC components and construction managers must possess the ability to quickly assess the situation and use his abilities to a good effect as acknowledging and addressing to certain SCC components will further strengthens project goals. Regardless of the kind of organization a Construction manager is it is necessary for him to learn how to best use the SCC to make their project a success [7]. The argument that the organizational

SCC exists is an undeniable fact the question that arises is whether or not it is a healthy or an unhealthy facet of an organizational culture.

This article comprises on six (6) chapters. First chapter explain the introduction of the study and shed light of existence situation of supply chain of construction industry. Second chapter illustrate the existence literature to support the study. It consists of brief explanation the history and situation of construction industry of Pakistan and its impact on industry and country. This this chapter elucidate the supply chain performance. Furthermore, explain the supply chain collaboration and supply chain integration. Lastly, framework and hypothesis has been drawn. Third chapter explain the research methodology of the study that shed light on research philosophy, research approach, population and sampling method. Forth chapter demonstrate results and findings of the study. Fifth chapter explain the discussion of the study and lastly sixth chapter conclude the study.

2. Literature Review

2.1. Construction Industry

Construction industry in the back bone of any developing countries, GDP mainly raises from construction projects .Bridges, Dams, infrastructure, transportation, railway tracks, ports harbor, housing schemes, Airport and many other Building structure came under umbrella of construction industry [8]. Current Government takes serious action to glow the construction industry that would serve our country rapidly and constantly. Projects like CPEC, Bahrain town, DHA cities in different region of cons try given us high employment of skilled and unskilled profession and labor. If construction industry raises it have the impact to glow fifty other industries directly. In Pakistan many of the construction project are abundant and not started after all approval have been completed for example the circular train project of Karachi was started in 1970 and now there is only track where stray dog and illegal encroachment spread Japan have given fund to initiate the project but no work started due to non-eligible Government individual [9].

From history it's pretty evident that organizations spent millions in fact billions of dollar in project, forming a cohesive team, all that goes in vain just because of the denial of Construction managers to acknowledge and cultivate Supply Chain Collaboration ties both internally and externally [10]. After the grading and scoring, the most important factor relevant to clients is economic ability and economic arrangement for the project, on which 100 % respondents agreed. Each table organizes each group of factors relevant to Construction industry and external delay factors are rated on a scale of 1 to 10. The significance rating for each factor was scored on a scale of 1 to 10 with 1 having the lowly importance and 10 the uppermost importance. The numbers in the filled cells for significance evaluation indicate the mean and mode values of responses for that alternative. Questionnaire takes a survey and obtained rating against each cause of delay due to client from the respondent [11]. Here in table mean value is the average value of the collected data against cause and mode is the greatest value among the value collected against each cause and critical index denoted how much significance of each cause produced delay.

Table 2. Causes of delay in large construction projects

S.no	Causes of delay in large construction projects	Agreed%	Not Agreed%
1	Financial flow for project	100	-
2	last working procedure	70	30
3	Client (Public, Private)	70	30
4	Construction completion time line	90	10
5	Sequencing of Activities for construction	70	30
6	Rectification in design	60	40
7	Unclear scope and schedule of demand	70	30
8	Material description to be procure	80	20
9	Complex Decision hierarchy	90	10
10	Delay in bill for completed work done	80	20

A vary of research by way of infinite researchers recognized the contractor associated delaying factors. Financial problems of contractors, sub-contractor problems first-class of contractor's work are the critical causes of delay. Similarly, it was proved that contractor related factors play an integral position in delaying any development project. While writing about contractor associated delaying factors, that the predominant problems associated to construction firmware the terrible internet site management, sub-contractors, insufficient planning, strategies used for development and insufficient experience of contractor. In the same line, Wei said that the difficulties in financing, clashes in sub-contractors agenda at some point of execution of project, redecorate due to errors, disadvantaged verbal exchange and organization, unsuccessful planning and scheduling of project, flawed implementation of building methods,

insufficient contractor's work, insufficient sub-contractors work, frequent alternate of sub-contractors terrible qualification of technical body of employees and net web page deployment are the indispensable elements associated to contractor. After reviewing the relevant literature, the following speculation has been developed to be tested in this learn about [8].

In most of the countries the GDP of construction industry is from 6% to 9%. On contrary to that in Pakistan this rate is very low that is 2.44%. It has been investigated delays in construction industry of Pakistan and revealed that majority of project were 11% 30% delayed from their scheduled time. The project in Pakistan completes behind the schedule and result in cost and time over run. There are various reasons that contribute to the delay causes some are due to financing from the clients, litigation, site disputes, total rejection and arbitration. Investor don't invest in this and avoid risk due to the uncertain condition of the industry [12]. The Pakistan's construction industry is building a large contribution in different economic sector including Water, Oil, Gas and petrochemical, Architecture and planning. Water Resources and dam Engineering. Public health engineering etc., it has been evaluated that yield of the part has a huge offer of 40-60% in gross fixed capital arrangement .further studies have recommended that there are 40 to 50 other industries which are directly and indirectly affected by the performance of construction sector. The development business is assuming an imperative role in monetary development of Pakistan. Economic survey of Pakistan (2018) demonstrates that the business became 9.1% in FY18 and contributed 2.7% to the nation (GDP). Both this number is behind other countries [13].

A scope of research by method for endless specialists perceived the temporary worker related postponing factors. As a misleading arranging by temporary worker, wasteful sites the executives, and lacking excursion of the contractual worker are the most significant thought processes of deferral. Money related issues of temporary workers, sub-contractual worker issues acceptable of contract based worker's work are the major thought processes of postponement. Furthermore demonstrated that temporary worker related components play a basic situation in postponing any development venture. While expounding on temporary worker related postponing elements, identified that the overwhelming issues identified with development firmware the negative site the board, sub-contractual workers, deficient arranging, forms utilized for improvement and lacking ride of contractual worker [14]. In the indistinguishable line, Wei announced that the challenges in financing, conflicts in sub-temporary workers plan sooner or later of execution of undertaking, rebuild because of blunders, impeded correspondence and association, fruitless arranging and booking of venture, ill-advised usage of building techniques, lacking contractual worker's work, deficient sub-temporary workers work, basic substitute of sub-temporary workers horrible capability of specialized group of laborers and page arrangement are the fundamental components related to contractual worker. In the wake of auditing the applicable writing, the accompanying speculation has been created to be tried in this investigation [15].

In latest centuries, supply chain performance integration has developed an evolving extent of standing for all supply chain performance in construction field. Therefore, integration is a theme which needs extra discovery. Although big statistics of problems of integration have been investigated but tranquil there is a small number of works around the understanding of the model of integration. Enormous statistics of organizations are fading and reluctant in the use of integration; this is in line to absence of understanding of integration and not suitable facts about benefit of strategies of integration [16]. Integration is a wide-ranging term; there are lots of small upcoming in the collected works about the understanding of integration that needs to be further explored. The main gap is, the concept of integration is not discussed in an understandable way and therefore lack of understanding of integration is still present in the literature. Very few literatures argued the preparation headed for teamwork and there is not an appropriate measurement system by which depth of integration is to be measured. The literature on the topics like a relationship, commitment, and trust between partners of the supply chain performance is not well studied.

2.2. Supply Chain Performance

Supply Chain Performance difficult to build accounts in this tight economy, providers expanding their business endeavors to hold existing clients and stay aggressive just in the event that they include more an incentive as contrasted and their rivals. Decrease in the item life cycle expands pressure on firms for growing new items. Because of rivalry comprehensively, inventory network has made weight on the individual from the production network, which is endured by growing new procedures that builds the cost efficiencies and consumer loyalty. In prior, coordinated effort in the inventory network is spoken to by 'colleagues' [17, 18]. Be that as it may, on account of private company, those which are not natural by the terms inventory network cooperation just utilize the term 'business managing'. The significance of every one of these terms is the joint effort of accomplices along the store network. Yet, the idea of coordinated effort isn't all around characterized as it required. The Inventory network is a finished cycle of the item, begins from provider to purchaser, there are different stages among them, and the generation line is one of significant from them. It is expounded SCP is a method wherein organizations associated with the store network are responsively cooperating to accomplish basic targets, and this is conceivable by sharing learning, data, benefits, and hazard, and Joint effort is common target that is in excess of a composed agreement. It has inferred that SCC is the joint working

among at least two firms through a store network to meet end clients fulfillment and the fundamental reason for coordinated effort is to streamline benefit, for all chain accomplices and make an aggressive edge [19].

SCC begins from the shallow exchange and cuts off with the responsive coordinated association and cooperative relationship lies on sharing of data and dispersion of hazard among the accomplices. Coordinated effort is essentially dictated by trust and duty which will change the adequacy of cost, quality and time. Organizations will work together by changing the connections between costs, worth and benefit condition. Along these lines, organizations cooperate by sharing data, procedure, dangers, and prizes to accomplish the common addition. SCC is exceptionally wide term more often than not length on the general store network. SCC is the working of at least two than two organizations by and large to run inventory network tasks and having the better outcome when contrasted with when these organizations work exclusively. The aftereffect of the coordinated effort is to reaction the vulnerabilities that emerge from conditions and having the fruitful understanding for all accomplices. It can convey generous advantages and favorable circumstances to its accomplices. There are three autonomous factors. In past study in SCC was related with on-time delivery, forecast accuracy, days in inventory, total warehouse management costs and total transportation costs customer relation, internal relation and external relation also related with SCC [18, 20].

2.3. Supply Chain Collaboration Approaches

To achieve the long haul preferences independently and all in all, data sharing is depicted as making a more grounded association between the association and its suppliers. The sharing of data elevates partners to take part in quality improvement programs notwithstanding customary organization exercises, Joint decision making targets making a long haul customer association, diminishing customer grievances and improving consumer loyalty [21]. By upgrading the customer association, association can respond quickly to adjusting customer necessities [22]. Inventory network execution the board methodology coordinated into joint basic leadership have been appeared to directly affect performance [23]. Risk and Reward Sharing (RRS) is characterized as a particular degree of connection between chain individuals that outcomes in higher business execution than individual firms would have accomplished.

2.3.1. Information Sharing

To attain the long-term advantages separately and collectively, information sharing is described as creating a stronger connection between the organization and its providers. The sharing of information promotes stakeholders to engage in quality improvement programs in addition to regular company activities [24]. The approach of wide conveyed systems, intranets, cross-stage similarity, application porting and institutionalization of IP conventions have all encouraged the enormous development in worldwide data sharing. With regards to individual data nonetheless, regardless of the fact that it is so natural to port the genuine information, there are laws in many nations restricting the sharing of individual information without unequivocal consent being allowed. In the U.S. furthermore, Europe it is a criminal offense to share any close to home information about anybody without such express consent [25]. There is a lot of other data sharing that doesn't fall under the law and data sharing is expanding as more systems and associations interface and data winds up simpler to share over the web [10].

H₁: Information sharing positively related to Supply chain performance.

2.3.2. Joint Decision Making

Joint decision-making aims at creating a long-term client connection, reducing client complaints and improving customer satisfaction. By enhancing the client connection, an organization can react rapidly to altering client requirements. Supply chain performance management procedures integrated into joint decision-making have been shown to have a direct impact on performance [26]. At the point when you have constantly settled on your own choices, it very well may be hard to need to counsel another person on a standard premise [27]. In any case, this is the thing that happens when you are seeing someone, a long haul one, and especially when you are living respectively. Indeed, even moderately little choices, similar to whether to go out today around evening time, what shading to paint the washroom or the planning and area of a vacation, can be loaded with challenges if your preferences are altogether different [28].

H₂: Joint decision making positively related to Supply chain performance.

2.3.3. Risk and Reward Sharing

Risk and reward is defined as a specific level of relationship between chain members that results in higher business performance than individual firms would have achieved. Risk and reward Sharing Undertakings are altered each time for explicit accomplice needs [29]. All in all, these are the sorts of commitment that Attractive RRS is prepared to examine and make an undertaking structure for our money related accomplices Co-obtaining of avionics resources. Attractive RRS purchases flight resources for part-out and momentary rent ventures. We band together with different

associations in organizing high-esteem offers for armadas of benefits or sorts of advantages which are out of our degree. Together with accomplices we get into sorts of arrangements that none of us would approach individually. Project the executives for part-out ventures. Attractive RRS follows up on the advantage proprietor's or speculator's benefit to obtain, part out, fix, and sell avionics resources. In various cases we are prepared to focus on least return for capital invested numbers for our budgetary accomplice [30].

H₃: Risk and reward sharing positively related to Supply chain performance.

2.4. Supply Chain Integration

SCI begins from the shallow exchange and cuts off with the responsive coordinated association and cooperative relationship lies on sharing of data and dispersion of hazard among the accomplices. Coordinated effort is essentially dictated by trust and duty which will change the adequacy of cost, quality and time. Organizations will work together by changing the connections between costs, worth and benefit condition. Along these lines, organizations cooperate by sharing data, procedure, dangers, and prizes to accomplish the common addition. SCI is exceptionally wide term more often than not length on the general store network [20]. SCI is the working of at least two than two organizations by and large to run inventory network tasks and having the better outcome when contrasted with when these organizations work exclusively. The aftereffect of the coordinated effort is to reaction the vulnerabilities that emerge from conditions and having the fruitful understanding for all accomplices. It can convey generous advantages and favorable circumstances to its accomplices there are three autonomous factors. In past study in Supply chain integration was related with on-time delivery, forecast accuracy, days in inventory, total storeroom organization costs and total conveyance costs. Customer relation, internal relation and external relation also related with SCI [25].

2.4.1. Supply Chain Integration Approaches

Some of the definitions of SCI focuses on the flow of drugs and also the elements, others focus a lot of on flows data of knowledge}, resources and money. Though these descriptions contact several of the instance factors of SCI, they're intensive focused. Additionally, most fail to have faith in the character of methods of SCI., which has the manufacturer (internal integration) and increasing from it every directions (customer and supplier integration), and building upon its gaps to strengthen an ungenerous definition of SCI. The fundamental measure "integration" is delineate as "the unified management of a variety of sequential or comparable financial or especially industrial procedures erstwhile carried on independently". Applying this during a provide chain context, we have a tendency to define SCI because the degree to that a manufacturer strategically collaborates with its provide chain companions and collaboratively manages intra- and inter-organization processes. The intention is to amass fine and setting friendly flows of merchandise and services, information, cash and choices, to provide most price to the patron at low value and excessive pace [25].

2.4.2. Supplier Integration

In an implicit give chain, improvement of strong key organization with providers will offer office to their observation and expectation of the producer's needs, so as to all the more likely observe its evolving prerequisites. This equivalent trade of insights about items, procedures, timetables and abilities assists makers with improving their assembling plans and produce products on schedule, upgrading execution of the conveyance. By building up a top view of the maker's tasks, providers secure a high level of purchaser administration, which, thusly, enables the makers to improve their client assistance. Provider incorporation has been seen as related to item improvement execution and provider correspondences generally speaking execution. Others, nonetheless, have discovered no connection between provider coordination and operational execution [20].

H₄: Supplier integration positively related to Supply chain performance.

2.4.3. Internal Integration

Choosing the proper presentation measures is testing, because of the inborn multifaceted nature and reliance of supply chains. While contended that money related execution ought to be the primary proportion of SC execution on the grounds that of the investor benefit thought process, others have portrayed the confinements of depending entirely on monetary proportions of execution. It is proposed that SC execution estimation ought to incorporate operational pointers, for example, client support and the capacity to react to an evolving situation. It is recorded cost, time, quality, conveyance and adaptability as significant proportions of operational execution [10]. Albeit a few creators found no immediate connection between internal combination and operational execution, others found a positive connection between inside coordination and operational performance, including process effectiveness and coordination's administration execution. This study contends that inside coordination is the base for SCI and will be decidedly identified with operational execution.

H₅: Internal integration positively related to Supply chain performance.

2.4.4. Customer Integration

A close relationship between customers and the manufacturer offers opportunities for improving the accuracy of demand information, which reduces the manufacturer's product design and production planning time and inventory obsolescence, allowing it to be more responsive to customer needs. Because customer integration generates opportunities for leveraging the brain embedded in collaborative processes, it allows producers to reduce costs, create higher price and become aware of demand adjustments extra quickly. Customer integration has been discovered to be related to client satisfaction, each at once and indirectly, through its relationship to product development and innovation.

H₆: Customer integration positively related to Supply chain performance.

2.5. Research Framework

A framework was developed based on three independent variables (i.e. information sharing, joint decision making, and risk and reward sharing) and one dependent variable (i.e. Supply chain performance). Previous studies have revealed that all three approaches could positively affect the supply chain performance.

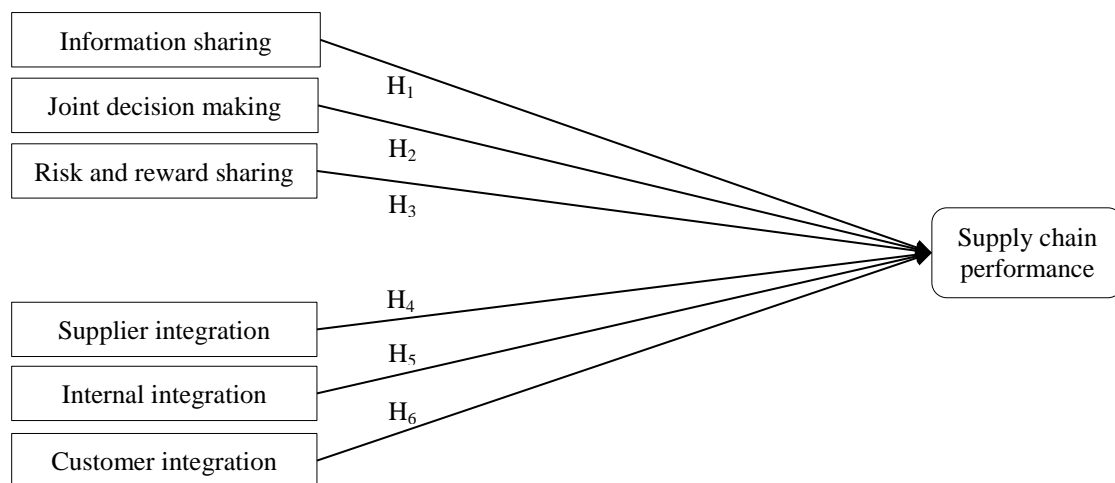


Figure 1. Research framework

2.6. Hypothesis

Supply chain collaboration empowers the chain individuals to form responsiveness to respond to request changes. Near collaboration empowers the supply chain accomplices to progress their capacity to fulfil client needs by adaptable offerings [31]. Choice synchronization and motivating force arrangement essentially impact responsiveness execution. Supply chain collaboration advances a firm's capacity to capitalize rapidly on showcase openings. For illustration, joint problem-solving increments the speed that items are brought to advertise by settling issues speedier [32]. Collaboration between supply chain accomplices can be sources of unused item thoughts.

H₁: Information sharing is positively related to Supply chain performance.

H₂: Joint decision making is positively related to Supply chain performance.

H₃: Risk & rewards is positively related to Supply chain performance.

H₄: Supplier integration positively related to Supply chain performance.

H₅: Internal integration positively related to Supply chain performance.

H₆: Customer integration positively related to Supply chain performance.

3. Research Design and Methodology

3.1. Research Design

In the mid-nineteenth and twentieth centuries, the application strategies related to quantitative research were those that used a post-positivist perspective that began to be fundamentally studied. Another condition of the study that is not evidence is a correlation clause in which analysts use an association score to determine and evaluate the mark or liaison (or connection) among at least two features or slashes. More as of late, quantitative methodologies have included complex tests with numerous factors and medicines (e.g., factorial plans and rehashed degree plans). They have moreover included expand basic condition models. As a way of seeing, positivism grips to the see that sole

"unquestionable" learning expanded through discernment (the resources), counting estimation, is dependable. In positivism, it is assumed that the activity of an expert is limited to objectively accumulating and explaining the data. In such studies, the disclosure of research information is usually perceived and quantifiable. Positivism depends on quantitative observations, which lead to quantitative estimates. In positivism considers approximately the work of the investigator is confined to data amassing and explanation in an objective way. A quantitative investigate could be a investigate that said as a positivistic strategy since it is based on logic of positivism. This strategy moreover expressed as a logical strategy since it as of now meets concrete, objective, quantifiable, judicious, and efficient standards. Investigate with quantitative method is approaches of experimental thinks about to gather, analyze, and show information in numerical shape instead of account. In quantitative thinks about, one employments hypothesis deductively and places it toward the starting of the proposed think about. With the objective of testing or confirming a hypothesis instead of creating it, the analyst progresses a hypothesis, collects information to test it, and reflects on its affirmation or disconfirmation by the comes about. The Research gets to be a framework for the total think almost, an organizing appear for ask approximately questions or speculations and for the data collection strategy. The investigator tests or affirms a speculation by analyzing theories or questions decided from it. A logical question can be that of a problem that has not been analyzed more explicitly, in the hope of establishing needs, providing operational definitions and progress as the final question of agreement. A clear question about any kind of effect chooses the best research plan, methodology for sorting information and guaranteeing subjects. You have to draw certain conclusions, figuratively speaking, with exceptional caution. Given its basic nature, research is often based on strategies. Offering a section of an exam methodology lasts after the standard classification. Different forms of this type appear in scientific journals, and these cases offer important models.

3.2. Methodology

The unit of analysis is construction firms because our dependent variable is supply chain performance which is related to Construction Company. With the target population of this research study is Project Managers & Technical Leads from top notch construction companies from Karachi, Pakistan which are registered from Pakistan Engineering Council. My population size is 1100-1200 which is divided in C-A, C-B and C-1 to C-6 categories are targeted population of this study. According of PEC registered C-A category construction firm in Karachi are 70, C-B category construction firm in Karachi are 70 and C-1 to C-6 category construction firm in Karachi are 1160. These all construction firm are top notch construction registered in Karachi with (PEC 2019). To execute research work this study will heavily relied on both the forms of data collection i.e. Primary & Secondary data collection. For Secondary data collection I will follow convenience non probabilistic sampling technique for my study. Sample is a partial or representative of the population under the study. By considering the large population and limited time and cost of research, the researcher needs to limit the samples in sampling. The sampling technique used is random sampling, which takes a random sample of a population that has been determined and suggested appropriate sample size between 100-110 respondents [33] in order to use interpretation estimation with (SPSS). For that reason, the number of samples will be determined based on the results of the minimum sample calculations. To achieve the long haul preferences independently and all in all, data sharing is depicted as making a more grounded association between the association and its suppliers. The sharing of data elevates partners to take part in quality improvement programs notwithstanding customary organization exercises, Joint decision making targets making a long haul customer association, diminishing customer grievances and improving consumer loyalty. By upgrading the customer association, association can respond quickly to adjusting customer necessities. Inventory network execution the board methodology coordinated into joint basic leadership has been appeared to directly affect performance. Risk and Reward Sharing (RRS) is characterized as a particular degree of connection between chain individuals that outcomes in higher business execution than individual firms would have accomplished. SCC is the working of at least two than two organizations by and large to run inventory network tasks and having the better outcome when contrasted with when these organizations work exclusively. The aftereffect of the coordinated effort is to reaction the vulnerabilities that emerge from conditions and having the fruitful understanding for all accomplices. It can convey generous advantages and favorable circumstances to its accomplices.

4. Data Analysis

4.1. Demographic Description

This section has been designed to critically analyze the data extracted from questionnaire which was then run on SPSS to find the relationship between independent variable and SCP. To find out the results a sample of 221 construction firm was mustered from all over Karachi. For better authenticity and concreteness of the research construction firms were specifically selected from registered with Pakistan Engineering Council. The respondents were served with questionnaire as shown in (Appendix I) having 27 different questions covering all the aspects of variables defined in Conceptual Framework in Figure 2.

4.1.1. Firm Category According to Pakistan Engineering Council (PEC)

Table 3. Category of firm

Firm Category	Frequency	Valid Percent
C-A (No limit with 2000 Professional Credits Points)	51	23.1
C-B (up to 4000M with 120 Professional Credits Points)	27	12.2
C-1 (up to 2500M with 55 Professional Credits Points)	29	13.1
C-2 (up to 1000M with 35 Professional Credits Points)	23	10.4
C-3 (up to 500M with 20 Professional Credits Points)	21	9.5
C-4 (up to 200M with 15 Professional Credits Points)	33	14.9
C-5 (up to 65M with 5 Professional Credits Points)	19	8.6
C-6 (up to 25M with 5 Professional Credits Points)	18	8.1
Total	221	100

4.1.2. Numbers of Employees

Firm which respond us that how many number of worker in construction firm who respond us from below data its represents 26.7 percent responded from the firm which have less than 100 workers, 30.3 percent responded from the firm which have 101-250 workers, 26.7 percent responded from the firm which have 251-500 workers, 8.1 percent responded from the firm which have 501-1000 workers and 8.1 percent responded from the firm which have more than 1000 workers.

Table 4. Numbers of employee

	Frequency	Valid Percent
LESS THAN 100	59	26.7
101-250	67	30.3
251-500	59	26.7
501-1000	18	8.1
More than 1000	18	8.1
Total	221	100

4.2. Data Screening

This research work includes distribution of 350 questionnaire through Google form and social communication sources to above mention construction firm registered with Pakistan Engineering council form which 222 responses was received and data cleaning ,missing value was eliminated through proper procedure and the outlier was removed from data ,duplication and repetition of data was also monitored the screened out.

4.3. Validity

This questionnaire was check by the expert for this supply chain management field and past researcher in supply chain management for measure the validity of the questions ask this questionnaire they felt comfortable regarding 26 ask questions in questionnaire.

4.4. Reliability

A reliability analysis was performed in order to check and assess the measurement tools providing consistent outcomes and it was found out to be 0.885 which shows good results and gives the first indication of the model being a fit one and have close variable relationship. According to Hair et al. (2014) [34], the Cronbach's Alpha value should be in between 0.5 and 0.7 in order to be considered as valid.

Table 5. Reliability

Variable name	Cronbach's Alpha	No. of Items
Information sharing	0.919	8
Joint Decision Making	0.924	7
Risk and reward	0.855	6
Supply chain performance	0.932	5

4.5. Hypothesis Testing

This model predicted that all independent variables have 39.6% significant on SCP and the one hypothesis is accepted and other two hypotheses are rejected in data hypothesis testing which was established in research question in research objective. Significance value of Information Sharing in 0.276 which is greater than 0.05 thus that mean this hypothesis is rejected, Impact value of Joint Decision Making in 0.000 which is less than 0.05 therefore that mean this hypothesis is Accepted, Significance value of Risk and Rewards in 0.062 which is more than 0.05 hence that mean this hypothesis is rejected,

Table 6. Model Summary

Model	R Square	Adjusted R Square
1	0.405	0.396

Table 7. Multiple regressions

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.341	0.375		3.578	0.000
IS	0.092	0.084	0.084	1.092	0.276
JDM	0.442	0.068	0.463	6.461	0.000
RRS	0.195	0.104	0.155	1.874	0.062
SI	0.855	0.050	0.756	3.452	0.023
II	0.774	0.056	0.684	1.727	0.001
CI	0.883	0.064	0.682	13.751	0.040

a. Dependent Variable: SCP

To sum-up it would be fair to say that SCP will bring a lot of joy to the fraternity of construction Project Management but the fact can't be denied that it can assist Project Managers but can't replace them. It is imperative for the construction team have the strategy first before applying SCP to know what benefits could be derived from it. SCP standalone will not guarantee Project Success; it is the ability of the Project Managers to deploy it purposefully to increase the project success rate. SCP could prove out to be the real game change in the field of Project Management and those who succeed in doing so would be the ones who see beyond the bound of human imagination. From the results obtained from regression analysis and model summary it is observed that there is a non-significant relationship exist between the ability of a Supply chain collaboration to Supply chain performance success and the hypothesis set above will accepted/rejected on the basis of results observed. Furthermore there is moderate to weak relationship found between the Dependent Variable with respect to Independent Variable derives the fact that there are more stronger factors comprising of SCC which can be used as a catalyst for SCP to achieve project goals.

Table 8. Result Summary

Hypothesis	Beta	Sig.	Result
H1: Information sharing is positively related to Supply chain performance	0.084	0.276	Rejected
H2: Joint decision making is positively related to Supply chain performance	0.463	0.000	Accepted
H3: Risk & rewards is positively related to Supply chain performance	0.155	0.062	Rejected
H4: Supplier integration positively related to Supply chain performance	0.756	0.023	Accepted
H5: Internal integration positively related to Supply chain performance	0.684	0.001	Accepted
H6: Customer integration positively related to Supply chain performance	0.682	0.040	Accepted

5. Discussion

As per the results recorded from the respondents it was assumed that use of SCP gives us the better picture how construction project will go, which work is currently going on and when will it ends. It definitely increases the productivity. These variables increase the overall productivity of the team, as it provides a complete framework of managing the construction project and reduces the time-lapses of each transaction that happens within the team. Hypothesis number one established in start of the is rejected however the same study was done According to [35] in construction project in Pakistan this hypothesis was rejected because this study was done in same county but in different region. According of in (Solovinia) in Tourism industry these factor have negative impact on SCP (Othman

et al., 2016) in Malaysia automobile industry this variable was used in their study, study also found non-significant impact on Supply chain performance. Because Pakistan and Malaysia are both developing countries [36]. SCP in Malaysia automobile industry these variables used in this study also has significant impact on Supply chain performance, because Pakistan and Malaysia are both devolving countries. Hypothesis number two established in start of this study accepted however the same study was done. According to Rashid et al. (2019) [8] in construction project in Pakistan this hypothesis was accepted because the enterprise environment factor and organizational process asset are same in Pakistan [37].

Hypothesis number three established in start of the is rejected however the same study was done According to Solakivi et al. (2015) [38] in construction project in Pakistan this hypothesis was rejected because of political influence was there that and risk and reward money or incentive is not float to individual who were deserve these incentives are either taken and Landlord or used and government officials. According of in (Solovinia) in Tourism industry these factor have negative impact on SCP in Malaysia automobile industry Risk and reward was used in this study also have non-significant impact on Supply chain performance, because Pakistan and Malaysia are both devolving countries. Meanwhile, the major contribution of this study is that it focuses on the supply chain performance of the construction industry, while previous studies have focused only on the main organization. Thus, it can be concluded that the long-term success of construction organizations of Pakistan is lightly dependent on their relationships with their information sharing and risk and reward [39]. If they want to avoid unnecessary delay or over budgeting, then they must focus on relationships with joint decision making. This study would also help construction managers to understand the importance of a good relationship while performing strategic decision making. Although previous stakeholder's theories have verified the information sharing' and join decision making relationship, this study adds a new perspective of risks and rewards sharing along with relationship. As trust is fundamental for the success of a good relationship, organizations can trust each other by sharing of risks and rewards [27].

Anyone who wanted to proceed in Supply chain collaboration study this study will be very beneficial to him one of this study independent variable and strongly associated with SCP and two were found non-significant in association with SCP after data collection, analyzing, testing and result and highly satisfying which was established in start of my study. The ability of Professional to not only effectively manage their technical aspects of but also the behavioral side of their job are the ones who stands out from the other two sets of Professional the ones who are naïve and other who are the sharks which clearly shows the character of an individual to manipulate the situation in their own favor. Project Managers who truly understands the inevitability of Supply Chain Management and acknowledge it by understanding the positive impact it can have on overall impact of Performance [40]. This research focused on smart approach of conduction and predominantly took construction industry into account to conform the hypothesis, further research on rest of the factors can further strengthen the pre-established theory depicting a direct link between cost constraint & schedule performance. Researcher can further broaden the scope of this research and extract more variables associated with construction project which plays a quintessential role in project success by their implications. Furthermore, impact of categorical variables discussed in this research can be further explored and new derivatives can be found out. It is quintessential for Project Managers to also realize the fact that SCM components exists in all the work packages of their genre.

6. Conclusion

The findings of this study revealed that all the approaches of supply chain collaboration (i.e. Information Sharing, Joint decision making, and Risk and rewards) have positive and significant effects on supply chain performance. Meanwhile, this study conclude that supply chain integration is more better than collaboration as construction organizations are willing to share their information with supply chain members only rather than all stakeholders. This empirical verification is in line with the previous studies and concludes that suppliers of construction organizations prefer to enhance their relationship, organizations can trust each other as this is vital for their relationship. This integration will provide a competitive position to all where members can share their expertise that will ultimately improve the quality, lead time, and enrich the flexibility. Furthermore, the downstream supply chains, which include distributors, retailers, and wholesalers, are also willing to develop their relationships with local firms as well as with the upstream. These relationships will provide timely, accurate and up to date information to all members and also serve as a safeguard against risks and disruptions. This study enlightens the researchers and practitioners with a new perspective that all members should go beyond the traditional relationships, and not only to improve planning, forecasting, and replenishment system with suppliers and customers. This study has unique findings as all integration approaches have significant effects while collaboration is not working for the same industry. This proves that members of supply chain construction can get benefit from integration but they hesitate to share their risks, rewards, and planning to all stakeholders. This study will help managers in decision making. This study will also help the government of Pakistan and China in completing their construction projects in time and with the designated cost.

7. Conflicts of Interest

The authors declare no conflict of interest.

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Appendix I: Questionnaire

		Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
INFORMATION SHARING						
1	Organization informs its trading partners in advance of changing needs					
2	Organization's trading partners share proprietary information with your organization					
3	Organization's trading partners keep your organization fully informed about issues that affect its business Organization					
4	Organization and its trading partners exchange information that helps establishment of business planning					
5	Organization's trading partners share business knowledge of core business processes					
6	Organization and its trading partners keep each other informed about events or changes that may affect the other partners.					
7	Participating in the sourcing decisions of your suppliers					
8	Participating in the marketing efforts of your customers					
JOINT DECISION MAKING						
9	Involving all members of your firm's supply chain in your product/service/marketing plans					
10	Contacting the end users of your products to get feedback on performance/customer service					
11	Shared operational decision making					
12	Willingness of collaborative problem solution					
13	Willingness of collaboration in strategic decision making					
14	Creating linkage with suppliers through information technology					
15	Creating linkage with customers through information technology					
RISK AND REWARD						
16	Shared risk and rewards					
17	Creating linkage with risk an rewards					
18	Responsible ownership					
19	Accountability ownership					
20	Consult ownership					
21	Inform ownership					
SUPPLY CHAIN PERFORMANCE						
22	Order fill rate: Percentage of orders completed in full within the planned order lead time.					
23	Order fulfillment lead time: The lead time from customer order origination to customer order receipt.					
24	Operations flexibility: Ability to meet production modification, shortages in inventory, and short-term fluctuation in demand.					
25	Inventory turnover: How many times a year the average inventory for a firm changes over or is sold.					
26	Total logistics cost: Overall, costs involving logistics activities.					